



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/564,479

01/13/2006

Seppo Heimala

1034281-000002

9194

21839 7590 04/07/2008
BUCHANAN, INGERSOLL & ROONEY PC
POST OFFICE BOX 1404
ALEXANDRIA, VA 22313-1404

EXAMINER

SHEVIN, MARK L

ART UNIT

PAPER NUMBER

1793

NOTIFICATION DATE

DELIVERY MODE

04/07/2008

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ADIPFDD@bipc.com

Office Action Summary	Application No. 10/564,479	Applicant(s) HEIMALA ET AL.	
	Examiner Mark L. Shevin	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 January 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>07/26/2006</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Status

1. Claims 1-19, filed as a preliminary amendment on January 13th, 2006, are pending.

Priority

2. Applicant's claim to foreign priority benefit of Finish patent application: 20031082, filed July 17th, 2003, has been recorded.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 1-14,16-18, and 20-21 (present in para 0026-0028. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 1793

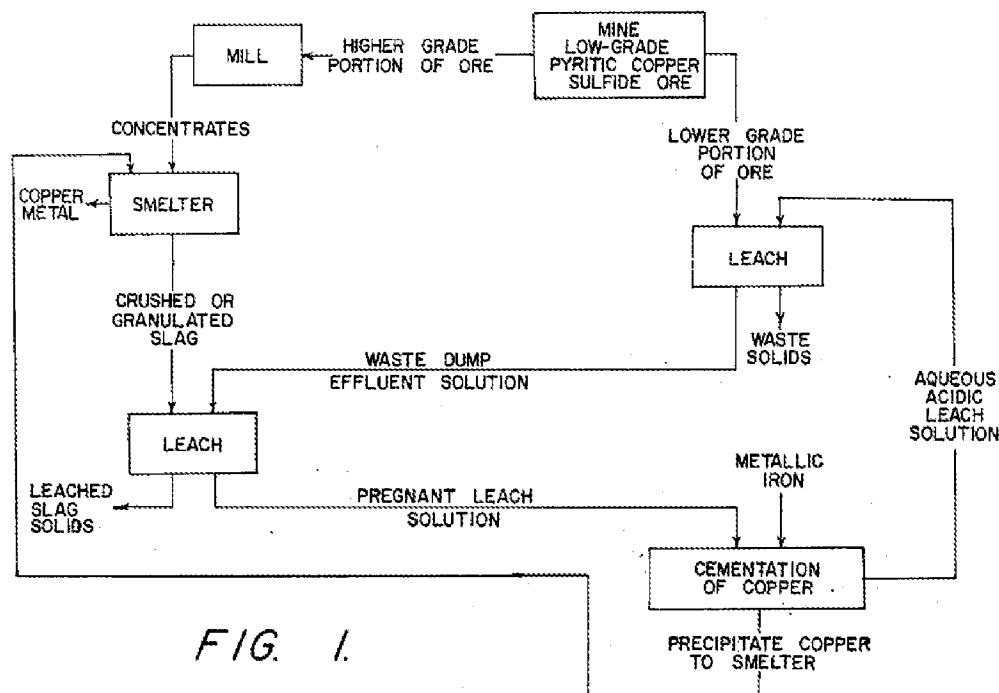
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. **Claims 1-7 and 9-10** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Schlitt** (US 4,152,142) in view of **Gabb** (US 5,616,168) and **Johnson** (US 3,957,602).

Schlitt



Schlitt is drawn to a method of smelting copper and improving the recovery of copper values from slag (col. 1, lines 15-25). Schlitt teaches (col. 4, lines 39-51) that "In reverberatory slags, to which the present invention is particularly adapted, substantially all the copper content therein is present as mixed sulfides in the chalcocite-bornite-chalcopyrite series." Furthermore, figure 1 indicates that low-grade pyritic copper sulfide ore is use. Thus Schlitt teaches "a method for smelting sulfidic copper concentrates...". A copper sulfide bearing material is first smelted in a smelting furnace as a higher grade portion of the pyritic copper sulfide ore is used for the "mill" of figure 1 which is subsequently put into a smelter as "concentrates". Col. 3, lines 45-53 teach that the copper ore, as mined, is pyritic sulfide ores and various oxide and silicate ores. The slag from the smelting furnace is crushed or granulated, leached, and the pregnant leach solution subjected to a cementation process as shown in figure 1. The copper precipitate from the cementation step is then fed back into the smelting furnace. Schlitt, however, does not explicitly teach that the material being fed back to the smelting furnace is a "copper sulfide bearing material."

Gabb

Gabb is drawn to the treatment of impurities streams during the smelting of copper concentrate and the converting of copper matte (col. 1, lines 14-17). In particular, his invention relates to a streamlined hydrometallurgical process that captures and returns for further processing many impurity stream components (col. 1, lines 22-25). Gabb teaches that copper is precipitated as cupric or cuprous sulfide (copper bearing material) and recovered by solid/liquid separation techniques for

Art Unit: 1793

ultimate return to the smelter, in contrast to some conventional hydrometallurgical processes requiring electrowinning which are more cumbersome and energy-consuming (col. 7, lines 15-21). Furthermore, the amount of copper extracted is maximized at a high level of over 90% (col. 7, lines 24-25).

Johnson

Johnson teaches a process for hydrometallurgically recovering copper from chalcopyrite (copper sulfide material) which involves leaching and converting the chalcopyrite to form an insoluble copper sulfide (claim 9). The leaching / conversion reaction is conducted between about 150 and 250 °C (col. 2, lines 31-40) and furthermore the reaction time is inversely proportional to temperature, the amount of time decreasing with increased temperatures (col. 2, lines 53-55).

Regarding claim 1, it would have been obvious to one of ordinary skill in the copper smelting arts, at the time the invention was made, taking the disclosures of Schlitt, Gabb, and Johnson as a whole, to combine Schlitt in view of Gabb and Johnson to modify Schlitt to carry out a method of smelting sulfidic copper concentrates where a copper sulfide, hydrometallurgically removed from the smelt slag in a process including a conversion step, is recycled back into the smelter for the following reasons. Schlitt teaches that the precipitated copper after cementation is recycled back to the smelter (col. 5, lines 34-36) however Gabb teaches instead of the subsequent solvent extraction / electrowinning (SX-EW) processes of the prior art, one can precipitate copper as a sulfide and return it to the smelter, the benefit being greater overall process efficiency (col. 7, lines 15-21). Johnson adds that the conversion of copper leached from

Art Unit: 1793

chalcopryrite ore and subsequently converted to copper sulfides allows for better separation based on differences in solubility (claims 1 and 9) as the copper sulfide is later treated to recover elemental copper (claim 1). Johnson thus adds to Gabb's suggestion to recycled copper sulfide precipitates back to the smelter. Thus motivation to modify Schlitt comes from the reasonable expectation of greater overall process efficiency as taught by Gabb and the method of precipitating copper sulfide precipitates as taught by Johnson..

Regarding claim 2, the slag created in the smelting process of Schlitt is treated in at least two hydrometallurgic processing steps, namely leaching and cementation / precipitation (Fig. 1). Furthermore, Gabb teaches the copper sulfide precipitate could be subjected to flotation before heading to the smelter (col. 9, lines 1-10).

Regarding claim 3, the copper bearing ore is leached to form a pregnant solution containing soluble copper (col. 6, lines 4-7) and this is subjected to a conversion or precipitation operation to form sulfide as explained in the rejection to claim 1 above.

Regarding claims 4 and 5, Schlitt teaches the ore may be silicate ore (col. 5, line 49). Schlitt teaches that the after the slag is crushed and leached, ferrite iron values are in the leached solution (claim 3) and this would lead one of ordinary skill in the art to conclude that the slag is consequently ferrite bearing. Furthermore, Makinen (US 4,717,419) teaches the valuable metals in copper slags are normally bound to silicates, ferrites and other such compounds (col. 1, lines 45-49).

Regarding claim 6, Schlitt teaches that temperature and pressure and not critical in the leach steps of his inventions and that his process is effectively carried out at

ambient temperatures and pressures, and that the use of autoclaves or closed systems is not necessary (Col. 4, lines 34-38).

Regarding claim 7, Gabb teaches that the acid leach step is preferably conducted between 75 and 95 °C (col. 6, lines 40-44).

Regarding claims 9 and 10, as explained in the rejection of claim 1 above, Johnson suggests that the conversion of copper leached from chalcopyrite ore and subsequently converted to copper sulfides allows for better separation based on differences in solubility (claims 1 and 9) as the copper sulfide is later treated to recover elemental copper (claim 1).

Furthermore, the temperature at which the conversion step should be conducted as taught by Johnson overlaps the claimed temperature ranges of 90-200 °C and 150-190 °C and thus establishes a prima facie case of obviousness.

5. **Claims 8 and 11-19** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Schlitt** (US 4,152,142) in view of **Gabb** (US 5,616,168) and **Johnson** (US 3,957,602) as applied to claims 1-7 and 9-10 above, in further view of **Heimala** (US 5,108,495) and **Richmond** (US 6,537,440).

The disclosures of Schlitt, Gabb, and Johnson were discussed in the rejections of claims 1-7 and 9-10 above, however none of these references teaches leaching being carried out in an autoclave.

Heimala teaches in Example 4, (starting at col. 8) a specific embodiment using the process of his invention to separate copper minerals containing arsenic and antimony from essentially pure copper minerals such as chalcosite, covellite,

Art Unit: 1793

chalcopyrite, etc. (col. 8, lines 34-40). Furthermore, the method can be applied to slags (col. 4, lines 6-10). Example 3 teaches recovering valuable components from a sulphide ore based on pyrrhotite where leaching was carried out in an autoclave (col. 7, lines 50-62).

Richmond teaches that for extracting copper from a mineral feed containing copper sulphide mineral (abstract) and that highest leach recoveries are often obtained by having elevated ferric/ferrous rates at the end of the leach. This is difficult to attain in an atmospheric leach as the rate of oxygen dispersion in the pulp is limited (col. 2, lines 14-21). Richmond subsequently teaches that autoclave leaching should be carried out to address the deficiencies of the prior art processes (col. 2, lines 18-21 and Abstract, feature **20** in Figure. 1).

Richmond further teaches that there may be more than one leaching step including one or more subsequent leaching steps carried out under normal atmospheric conditions (col. 3, lines 24-29).

Regarding claim 8, it would have been obvious to one of ordinary skill in the copper smelting art, at the time the invention was made, taking the disclosures of Schlitt, Gabb, Johnson, and Richmond as a whole, to combine Schlitt in view of Gabb and Johnson further in view of Heimala Richmond to conduct slag leaching in an autoclave as Richmond suggests that autoclave promotes high leach recoveries by better controlling ferric/ferrous rates at the end of the leaching of copper sulphide ores and Heimala teaches similarly teaches recovery of valuable components from a sulphide ore by autoclave leaching. One would have a reasonable expectation of

Art Unit: 1793

success in applying Richmond's suggestion to copper sulphide bearing slags as his invention was applied to copper sulphide bearing ore that contains similar metal compounds and would thus be expected to react similarly.

Regarding claims 11 and 19, none of Schlitt, Gabb, or Johnson teach controlling hydrometallurgical processes using electrochemical measurements.

Heimala teaches a method for controlling a process in which complex ores and/or concentrates are treated in order to achieve valuable components contained therein where the process is controlled by oxidation/reduction reactions, flotation, leaching, and precipitation processes for different materials (col. 1, lines 5-12). The object of Heimala's invention is to control a process using active mineral electrodes and analyzing the state of the solid surface and/or the state between the solid material and the intermediate material and subsequently controlling these interfaces (col. 2, lines 21-30).

Impedance analysis is used to control leaching and flotation processes and the information measured by impedance analysis means that the leaching velocity can be maximized for sulphur compounds and compounds such as pyrite (FeS_2) or NiS_2 can be passivated (col. 2, lines 45-68). Furthermore, the covering effect created by a given sulphur compound using a reagent such as sulphides can be chosen such that selective flotation, leaching, or precipitation is carried out, resulting in economic advantages (col. 3, lines 1-9).

Heimala teaches in Example 4, (starting at col. 8) a specific embodiment using the process of his invention to separate copper minerals containing arsenic and

Art Unit: 1793

antimony from essentially pure copper minerals such as chalcosite, covellite, chalcopyrite, etc. (col. 8, lines 34-40). Furthermore, the method can be applied to slags (col. 4, lines 6-10).

Thus it would have been obvious to one of ordinary skill in the copper smelting arts, at the time the invention was made, taking the disclosures of Schlitt, Gabb, Johnson, Heimala, and Richmond as a whole, to control the leaching and conversion steps as claimed for the following reasons: Heimala teaches a method for controlling the surface state using mineral specific potentials (col. 9, lines 10-14), impedance values (col. 9, line 15), and solution content values (claims 6 and 7) where this process is used to control conversion (precipitation of sulfide which is part of precipitation - claim 10) and leaching (claim 11). Heimala further teaches that his process can be applied to copper sulfide bearing materials (Examples 3 and 4) and teaches that the process can be used with slags as well (col. 4, line 10).

Regarding claims 12 and 13, Schlitt teaches the ore may be silicate ore (col. 5, line 49). Schlitt teaches that after the slag is crushed and leached, ferrite iron values are in the leached solution (claim 3) and this would lead one of ordinary skill in the art to conclude that the slag is consequently ferrite bearing. Furthermore, Makinen (US 4,717,419) teaches the valuable metals in copper slags are normally bound to silicates, ferrites and other such compounds (col. 1, lines 45-49).

Regarding claims 14 and 15, Schlitt teaches that temperature and pressure are not critical in the leach steps of his inventions and that his process is effectively carried out at ambient temperatures and pressures, and that the use of autoclaves or closed

Art Unit: 1793

systems is not necessary (Col. 4, lines 34-38). Gabb teaches that the acid leach step is preferably conducted between 75 and 95 °C (col. 6, lines 40-44).

Regarding claim 16, both Johnson and Heimala teach the use of autoclave leaching in recovering metal from copper sulfide ore. Richmond subsequently teaches that autoclave leaching should be carried out to address the deficiencies of the prior art processes (col. 2, lines 18-21 and Abstract, feature **20** in Figure. 1).

Regarding claims 17 and 18, as explained in the rejection of claim 1 above, Johnson suggests that the conversion of copper leached from chalcopyrite ore and subsequently converted to copper sulfides allows for better separation based on differences in solubility (claims 1 and 9) as the copper sulfide is later treated to recover elemental copper (claim 1).

Furthermore, the temperature at which the conversion step should be conducted as taught by Johnson overlaps the claimed temperature ranges of 90-200 °C and 150-190 °C and thus establishes a prima facie case of obviousness.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure

Makinen (US 4,717,419)

Rantapuska (US 4,917,775)

Ruonala (M. Ruonala et al, Different aspects of using electrochemical potential measurements in mineral processing, *Int. J. Miner. Process.* 52 (1997) p. 97-110).

-- **Claims 1-19 (All pending) are rejected**
-- **No claims are allowed**

Art Unit: 1793

The rejections above rely on the references for all the teachings expressed in the text of the references and/or one of ordinary skill in the metallurgical art would have reasonably understood or implied from the texts of the references. To emphasize certain aspects of the prior art, only specific portions of the texts have been pointed out. Each reference as a whole should be reviewed in responding to the rejection, since other sections of the same reference and/or various combinations of the cited references may be relied on in future rejections in view of amendments.

All recited limitations in the instant claims have been met by the rejections as set forth above. Applicant is reminded that when amendment and/or revision are required, applicant should therefore specifically point out the support for any amendments made to the disclosure. See 37 C.F.R. § 1.121; 37 C.F.R. Part §41.37 (c)(1)(v); MPEP §714.02; and MPEP §2411.01(B).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark L. Shevin whose telephone number is (571) 270-3588. The examiner can normally be reached on Monday - Thursday, 8:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark L. Shevin/

/Roy King/

Supervisory Patent Examiner, Art Unit 1793

March 19th 2008
10-564,479